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POWER WIZARD® PW-250 OPERATION INSTRUCTIONS

THEORY OF OPERATION: The PW-250 uses a new measurement principle (patent granted) to achieve unprecedented convenience and performance. The unit measures the rate of change of temperature (both heating and cooling) induced in an aluminum mass by incident laser power. A sophisticated analog computer evaluates the temperature of the probe, cooling rate before laser application and heating rate of the probe during laser application. Knowledge of these three values is sufficient to compute incident power using mathematical formulas, regardless of probe's immediate thermal history.

Upon resetting the computer by means of the "reset button", the present cooling rate of the laser target is stored into memory. If the target was not previously exposed, the cooling rate is zero. Release of the reset button also starts a timer, which produces an audible beep signal after about six seconds. In the six-second interim, the target can be exposed to laser power and the heating rate is then computed. The value of the computed power based on the stored cooling rate and present heating rate is continuously displayed. The heating rate settles and stabilizes about three seconds after exposure, and the correct power is then displayed. This setting time is sufficiently shorter than the six second timing sequence, to allow placement of the target into the beam and to allow stabilized conditions to be reached. After the timing sequence has elapsed, the LCD display gets a 'hold' command, indicated by the beep. Then the PW-250 can be removed from the laser beam, with the stabilized power displayed on the LCD. The power reading remains displayed until the PW-250 shuts off automatically. This occurs after about twenty seconds, and is preceded by a fast series of beeps.

The useful temperature range of the target is zero to one hundred fifty degrees Celsius (0 – 150°C). Accurate measurements can be performed at any temperature in between. Damage to the target and sensor can occur if the temperature of the target exceeds 180°C. The PW-250 will beep continuously if the target temperature is over 150°C.

The target's absorption is relatively constant as a function of wavelength (see graph). No calibration factors need to be applied when using the PW-250 with CO_2, YAG, near IR (diode), Visible or Excimer lasers. The change in target absorption is less than 3%. When using the PW-250 with Carbon Monoxide (CO) lasers, indicated values should be multiplied by a factor of 1.03 for improved accuracy. Each PW-250 is individually calibrated at 10.6 μm (CO_2), with the calibration traceable to NIST.

OPERATION INSTRUCTIONS:

1. To activate the unit, press and hold the RESET/POWER button for at least two seconds. This initializes the computer.
2. The meter should read 0±0.3 watts or less. If the reading is not within this range, repeat step one.
3. The timing sequence begins with the release of the RESET/POWER button, so the PW-250 should quickly be placed into the beam.
4. Observe the LCD during measurements. It will show readings increasing to the final value within three to four seconds after insertion into the beam.

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5. In about fifteen seconds, when the reading has stabilized, you will hear a series of beeps indicating the 'hold' command. If the power has not stabilized by the end of the fifteen (6) second interval due to a) the target not being held still; b) beam not all on target ; or c) unit malfunction. The 'hold' feature allows measurements to be taken "blind", such as when the unit is inserted into places with difficult access and where visual monitoring of the LCD is troublesome or not possible.

6. While exact centering of the laser beam on the target is unnecessary, avoid moving the target once it has been inserted into the beam path. Excessive target motion will give an erroneous result in a power reading.

7. The heat capacity of the target is sufficient to allow multiple, low-power measurements in rapid succession and without immediate cooling. When using the PW-250 on medium power lasers in the range of 100 watts or more, caution should be exercised not to overheat the sensor or case by excessive exposure time. On a 25W laser, approximately fifteen consecutive readings may be taken. About three measurements in rapid succession can be taken on a 100W laser. Only a single measurement can be taken at the 250W level before the unit must be allowed to cool. An overheated target is indicated by a continuous beep, at which time the target must be allowed to cool. Cooling may be accelerated by placing the unit under a fan. **IMPORTANT** DO NOT COOL THE UNIT BY IMMERSING IT IN WATER, AS THIS WILL DAMAGE THE ELECTRONICS.

8. Care must be taken to hit the target, rather than the case. In addition, it is important to move the PW-250 in and out of the beam quickly, without letting the beam dwell on the case. It is permissible to turn on the laser ***after*** the PW-250 target has been placed in the beam path. Be sure to complete the measurement before the six-second timer has elapsed. Never press the reset button while the target is exposed to the laser beam. The computer will not be initialized properly.

9. The PW-250 can be used to measure laser power between a focusing lens and work piece. The unit can also be used to measure power emitted from optical fibers. **IMPORTANT** WHILE THE PW-250 TARGET HAS A VERY HIGH DAMAGE THRESHOLD, THE TARGET SHOULD NEVER BE PLACED AT THE FOCAL POINT OF A LENS. THE PW-250 TARGET SHOULD BE PLACED EITHER IN FRONT OF OR BEHIND THE FOCAL POINT, THUS MINIMIZING THE POWER DENSITY WITHOUT OVERFILLING THE TARGET AREA. The maximum allowable power density is 20kW/cm^2.

10. **BATTERY CHANGE:** The battery will not need to be replaced for about five years, even under constant use. Current drain of the unit is less than 0.5 mA. The battery capacity is sufficient for about 25,000 measurement cycles. The need for battery replacement is indicated when "BAT" appears on the LCD. The three CR 2025 Lithium batteries required are readily available and can be changed by removing the three screws on the rear half of the case. **IMPORTANT** DO NOT REMOVE THE SCREWS ON THE FRONT (DISPLAY) SIDE.

11. **WARRANTY:** The PW-250 is warranted for twelve (12) months from the date of purchase, provided it is used per the instructions above. Synrad is not responsible for damage caused by improper use, particularly water immersion or overheating. Synrad will repair or replace at no charge to consumer any PW-250 that fails due to manufacturing or design defect. Defective unit must be returned to Synrad freight prepaid. Prior to returning the unit you must obtain a Return Authorization (RA) number. Please call (425) 349-3500 or (800) SYNRAD1 or fax (425) 485-4882 to obtain an RA number.

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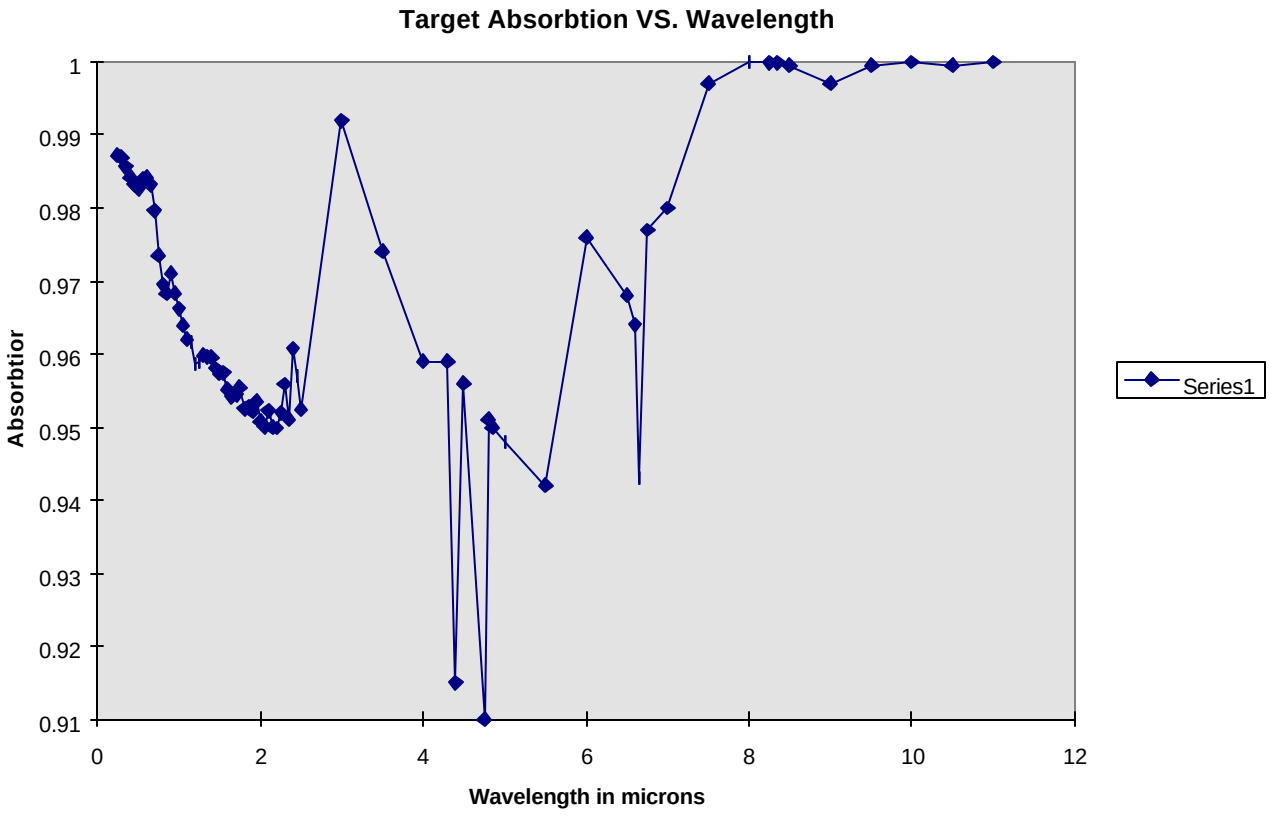
TARGET ABSORPTION VS. WAVELENGTH

Figure One (1)



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